

**What is claimed is:**

1           1.    An    apparatus    for    metal    electroplating,  
2    comprising:

3           a    electroplating tank for containing an electrolyte

4           at a first temperature;

5           a    substrate holder for holding a semiconductor

6           substrate; and

7           a heater for heating the portion of the electrolyte

8           adjacent to the substrate holder to a second

9           temperature higher than the first temperature.

1           2.    The apparatus as claimed in claim 1, wherein  
2    the heater comprises an electrothermal coil.

1           3.    The apparatus as claimed in claim 1, wherein  
2    the heater comprises a heat-exchange pipe containing  
3    thermal oil.

1           4.    The apparatus as claimed in claim 1, wherein a  
2    temperature difference of about 5 to 60 °C exists between  
3    the second temperature and the first temperature.

1           5.    The apparatus as claimed in claim 1, wherein  
2           the second temperature is about 27 to 80 °C.

1           6.    The apparatus as claimed in claim 1, wherein  
2           the electrolyte comprises Cu ions.

1           7.    The apparatus as claimed in claim 1, wherein  
2           the heater is embedded in the substrate holder to  
3           generate heat and conduct heat to the substrate and the  
4           adjacent electrolyte thereof.

1           8.    The apparatus as claimed in claim 1, wherein  
2           the heater is independently disposed in the  
3           electroplating tank and in a position opposite to the  
4           substrate holder.

1           9.    A method of metal electroplating, comprising  
2           the steps of:

3           placing a semiconductor substrate into an  
4           electroplating tank filled with an  
5           electrolayte; and

6 heating the portion of the electrolyte adjacent to  
7 the semiconductor substrate via an independent  
8 heater during electroplating of the  
9 semiconductor substrate.

1 10. The method as claimed in claim 9, wherein the  
2 heater is independent to the electroplating tank and  
3 disposed in a position opposing the semiconductor  
4 substrate.

1 11. The method as claimed in claim 9, wherein the  
2 semiconductor substrate is held by a substrate holder and  
3 the heater is embedded therein.

1 12. The method as claimed in claim 9, wherein the  
2 heater comprises an electrothermal coil.

1 13. The method as claimed in claim 9, wherein the  
2 heater comprises a heat-exchange pipe containing thermal  
3 oil.

1 14. The method as claimed in claim 9, wherein the  
2 electrolyte comprises copper (Cu) ions.

1           15. A method of metal electroplating, comprising  
2 the steps of:

3           providing an electroplating tank containing an  
4           electrolyte at a first temperature, wherein the  
5           electrolyte comprises metal ions;

6           immersing a semiconductor substrate held by a  
7           substrate holder into the electrolyte;

8           heating the portion of the electrolyte adjacent to  
9           the semiconductor substrate to a second  
10          temperature by a heater independent of the  
11          electroplating tank; and

12          electroplating the semiconductor substrate with the  
13          portion of the electrolyte at the second  
14          temperature to form a metal layer thereon.

1           16. The method as claimed in claim 15, wherein a  
2 seed layer of the same type of metal ion as that in the  
3 electrolyte is formed over the semiconductor substrate  
4 prior to immersion of the semiconductor substrate.

1           17. The method as claimed in claim 15, wherein the  
2 heater comprises an electrothermal coil.

1           18. The method as claimed in claim 15, wherein the  
2 heater comprises a heat exchange pipe containing thermal  
3 oil.

1           19. The method as claimed in claim 15, wherein the  
2 heater is disposed in a position opposing the  
3 semiconductor substrate in the electroplating tank.

1           20. The method as claimed in claim 15, wherein  
2 heater is embedded in the substrate holder.

1           21. The method as claimed in claim 15, wherein a  
2 temperature difference of 5 to 60 °C exists between the  
3 second temperature and the first temperature.

1           22. The method as claimed in claim 15, wherein the  
2 second temperature is about 27 to 80 °C.

1           23. The method as claimed in claim 15, wherein the  
2 electrolyte comprises copper (Cu) ions.